Jan. 3, 1961 J. DEISS ET AL 2,966,782

DEVICE FOR KNITTING A BACKED FABRIC WITH BINDING THREAD

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Fig. 1

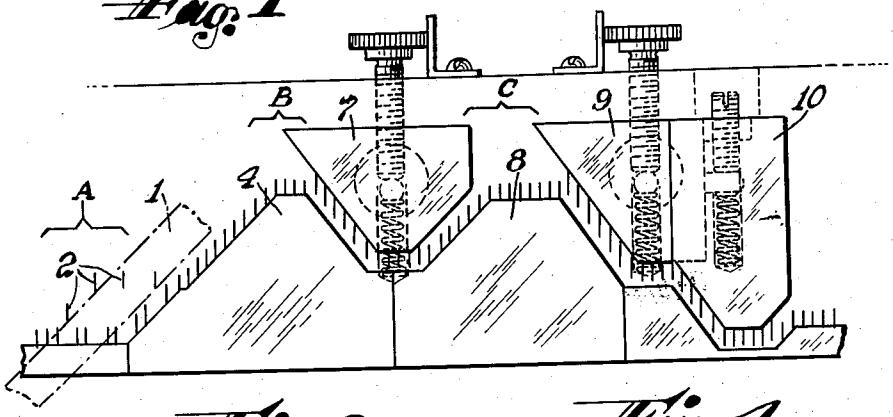


Fig. 2

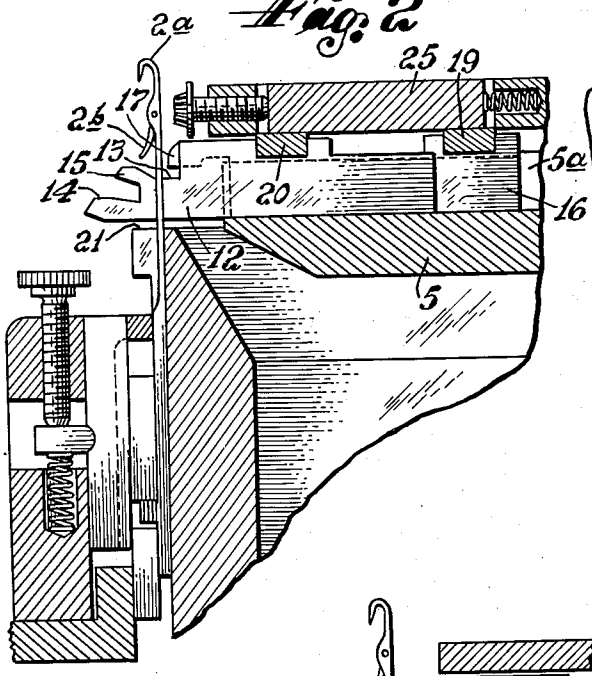
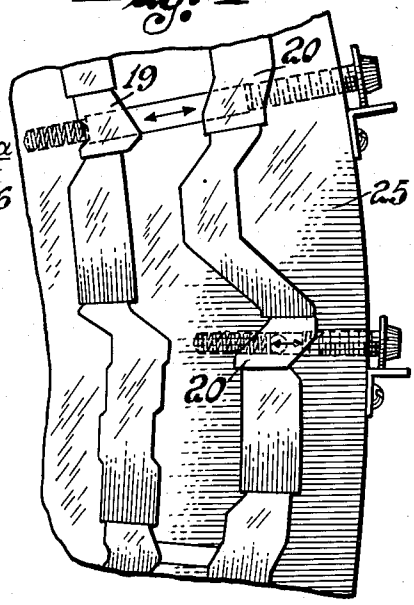


Fig. 4



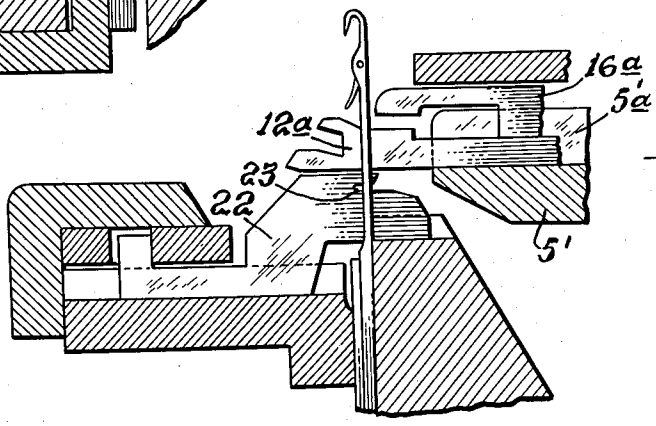


Fig. 3

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DEVICE FOR KNITTING A BACKED FABRIC WITH BINDING THREAD

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Fig. 5

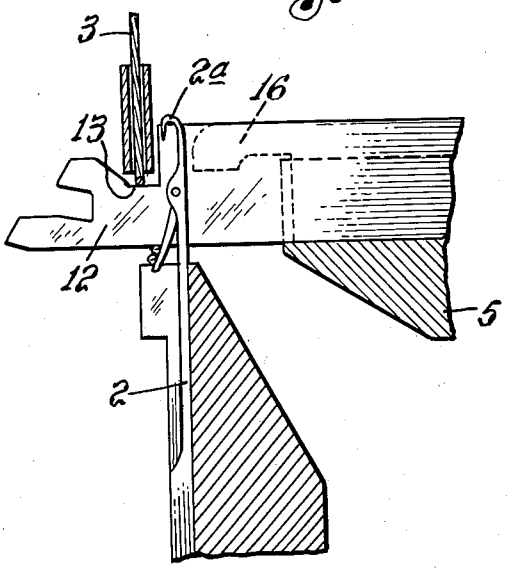


Fig. 6

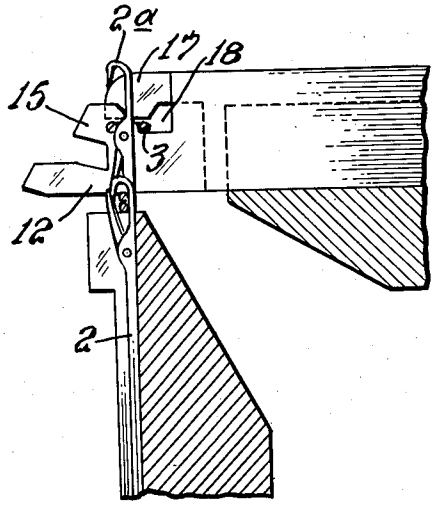


Fig. 7

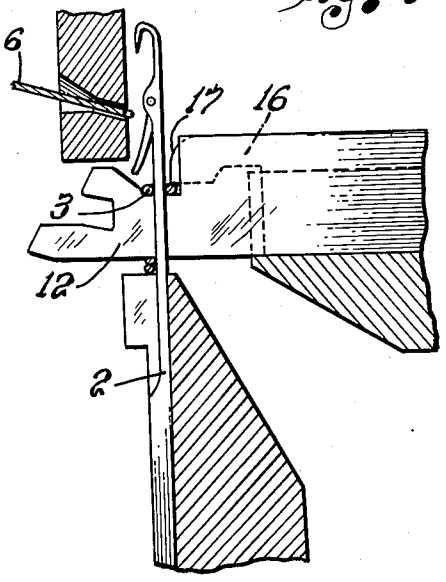
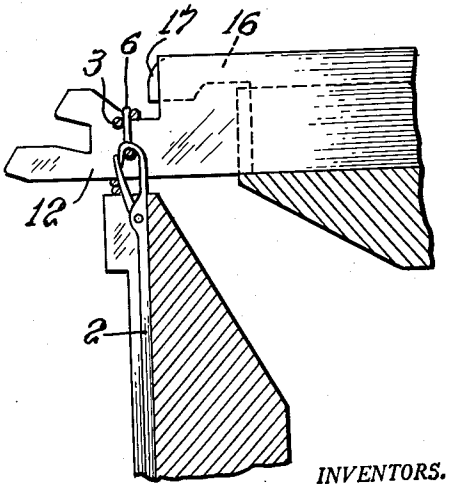


Fig. 8



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Fig. 9

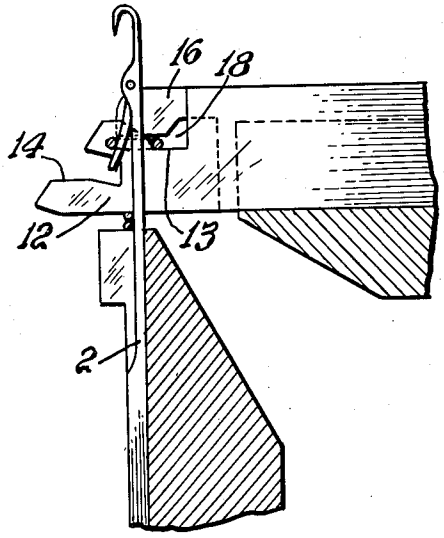


Fig. 10

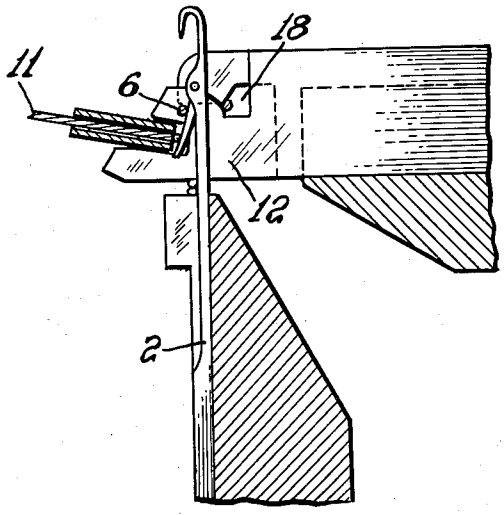


Fig. 11

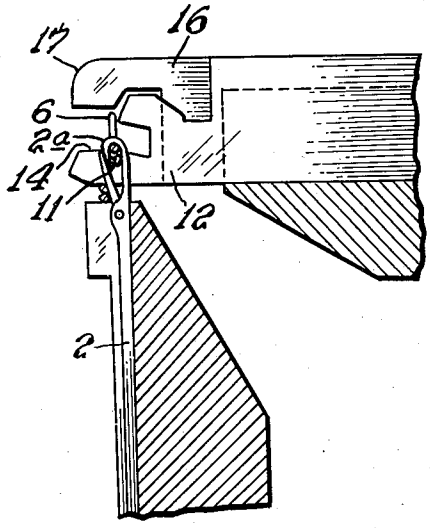
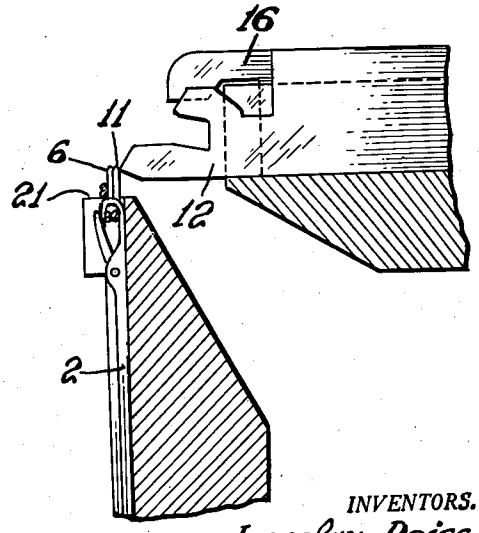


Fig. 12



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United States Patent Office 2,966,782 Patented Jan. 3, 1961

2,966,782

DEVICE FOR KNITTING A BACKED FABRIC WITH BINDING THREAD

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Filed Dec. 18, 1957, Ser. No. 703,619

2 Claims. (Cl. 66—9)

This invention relates to a device for knitting a backed fabric with binding thread on a circular knitting machine having latch needles, and more particularly is directed to a device for knitting fabric in accordance with the method disclosed in United States Letters Patent No. 2,836,970 to Jaroslav Deiss and Jaroslav Dvorak, dated June 3, 1958.

Knitting machines having latch needles and by which backed fabrics are manufactured from three threads are presently known, for example, knitting machines of the kind disclosed in United States Letters Patent No. 2,094,180 to Mishcon and United States Letters Patent No. 2,098,303 to Moses. However, the fabrics produced with such known machines do not have the basic characteristic of the knitted fabrics employing the method disclosed in the above referred to Patent No. 2,836,970, and whereby the entire length of the binding thread is located at the back of the fabric and, therefore, is hidden.

In both of the above identified existing machines, the needles knit the stitches in one operation, that is, the loops are drawn only after the previous knitted stitches are cast off.

It is an object of the present invention to provide a device for knitting goods of the kind disclosed in the above identified Patent No. 2,836,970, and which perform the knitting operation with latch needles so that new loops are formed prior to casting off of the previously formed stitches.

Another object is to provide a device of the described character which combines the several operating elements into a single machine and permits individual control of each phase of the sequence of operations so that free drawing of the loops without overloading of the yarn may be assured, as well as precise forming of the covered stitches of the base fabric and secure feeding of the backing thread.

In accordance with an aspect of this invention, a knitting device employs latch needles having terminal hooks, and is equipped with paired sinker and locking elements guided in common radially extending slots in the needle cylinder, with the needles being actuated by combined needles cams while the sinker and locking elements are actuated by two sets of sinker cams.

The above, and other objects, features and advantages of the present invention, will be apparent in the following detailed description of illustrative embodiments thereof which is to be read in connection with the accompanying drawings, forming a part hereof, and wherein:

Fig. 1 is a diagrammatic view of cams for actuating the needles in a knitting device embodying the present invention;

Fig. 2 is a fragmentary sectional view of a knitting device embodying the present invention;

Fig. 3 is a view similar to that of Fig. 2, but showing another embodiment of this invention;

Fig. 4 is a fragmentary plan view of a double-tracked cam ring for actuating the sinker and locking elements of a knitting device embodying the present invention;

Fig. 5 is a fragmentary sectional view of the knitting device illustrated in Fig. 2, and showing the parts thereof positioned for the feeding of the backing thread and the casting off of previously formed stitches;

Fig. 6 is a view similar to that of Fig. 5, but showing the sinker elements thereof retracted to draw the backing thread across the needles;

Fig. 7 is a view similar to that of Fig. 5, but illustrating the position of the parts of the device during the feeding of the binding thread;

Fig. 8 is a view similar to that of Fig. 5, but illustrating the positions of the parts of the device when the binding thread is drawn into a loop;

Fig. 9 is a view similar to that of Fig. 8, but illustrating a later phase in the operation of the knitting device during which the loops of the binding thread with the cast off backing thread are closed and tensioned in order to open the latches of the needles;

Fig. 10 is a view similar to that of Fig. 9, but illustrating the feeding of the face or top thread;

Fig. 11 is a view similar to that in Fig. 10, but illustrating a still later phase in the operation of the knitting device during which loops are formed in the face or top thread and are finally released; and

Fig. 12 illustrates a final phase in the operation of the knitting device during which previously formed stitches are cast off over newly formed loops which are released at the moment of contact with the stitches.

Referring to the drawings in detail, and initially to Fig. 2 thereof, it will be seen that a knitting device embodying the present invention includes needles 2 which are arranged in a circular ring and which each include a terminal hook 2*a* and a latch 2*b*. The needles 2 are suitably mounted for vertical movement independent of each other, and the movements thereof are effected by single-acting combined or two phase needle cams which actuate the needles in the usual manner and have the configuration illustrated diagrammatically in Fig. 1.

The backing thread 3 (Fig. 5), the binding thread 6 (Fig. 7) and the top of facing thread 11 (Fig. 10) are fed successively, in the order named, at locations which are spaced apart circumferentially along the needle ring and which are indicated at A, B, and C respectively, on Fig. 1.

As seen in Fig. 1, all of the needles may have the same form of butts, and those which are to receive the backing thread, at the location A, may be selected by a pattern wheel 1 or by a slide member, or the needles may have three different forms of butts which are selected by suitable cams, so that only predetermined needles will be elevated at the location A in order to receive the backing thread. The selection of the needles and the feeding of the backing thread may occur simultaneously, in the case of a single backing, or may occur as two consecutive operations, in the production of double backings.

The combined or two phase needle cams of Fig. 1 include a cam portion 4 which, following the selection of the needles and the feeding of the backing thread, is effective to raise all of the needles to an interlacing position, at location B, where feeding of the binding thread occurs. The needle actuating cams further include a lowering cam portion 7 which follows the cam portion 4 and is effective to lower all of the needles and thereby form loops in the binding thread. The cam portion 7 is followed by a cam portion 8 which again raises all of the needles for the feeding of the top or facing thread at the location C. The cam portion 8 is followed by a cam portion 9 which lowers all of the needles during the drawing of the loops of the top or facing thread and, finally, the needle actuating cams include a cam portion

10 following the portion 9 and effective to further lower the needles in order to effect casting off of a previously formed row of stitches and equalizing of the last row formed.

The knitting device embodying the present invention includes a series of paired sinker and locking elements 12 and 16, respectively, which are slidably mounted in radially extending slots 5*a* formed in the sinker head 5 and which are adapted to pass radially through the spaces between the successive needles 2.

Each pair of sinker and locking elements 12 and 16 may be disposed side-by-side in the related slot 5*a*, as shown in Fig. 2, or the locking element 16*a* may be disposed above the related sinker element 12*a* in the slot 5'*a* of the sinker head 5', as shown in Fig. 3.

As is shown in Fig. 2, each sinker element 12 is formed with two ledges 13 and 14, respectively, disposed at different levels for sinking the loops. The upper ledge 13 is effective during feeding of the backing thread 3 (Fig. 5) and sinking of the loops of the binding thread (Fig. 8), while the lower ledge 14 is effective during drawing of the loops of the top of facing thread 11 (Fig. 11). Further, the sinker 12 has a nose 15 which extends above and radially outward from the upper ledge 13 to draw the backing thread 3 during radially inward movement of the sinker (Fig. 6) and to hold the loops of the binding thread 6 in order to ensure that such loops will remain in the back of the basic fabric.

The locking element 16 associated with each sinker element 12 has a nib 17, at its radially outer end, which is adapted, upon radially outward movement of the locking element relative to the associated sinker element, to cooperate with the nose 15 of the latter in forming an enclosed space 18 (Figs. 6, 9 and 10) so that the loop of the binding thread 6 may be held securely with the backing thread 3 within the enclosed space 18 whether such threads are tensioned upwardly or downwardly. By shifting the sinker element 12 and the locking element 16 in the radially inward direction, either simultaneously or one at a time, the loops held within the spaces 18 can be tensioned to engage closely against the shanks of the needles for safe sliding along the latter and for opening of the needle latches when the needles are elevated (Fig. 9).

The sinker and locking elements 12 and 16, respectively, have butts thereon which are engageable by a double-tracked sinker cam ring 25 (Fig. 4) having adjustable sections 19 and 20 for adjusting the radially inward retracting movement and the radially outward advancing movement, respectively, of the actuated elements. The tracks of the cam ring 25 are suitably formed to effect the necessary individual or simultaneous movements of the sinker elements and locking elements which cause the backing thread to be drawn, the binding thread loops to be tensioned, and the loops to be gradually released when the previously formed stitches are knocked over. Knocking over of the previously formed stitches is effected either by a casting-off ledge 21 on the needle cylinder (Figs. 2 and 12) or by casting-off ledges 23 provided on additional sinkers 22 (Fig. 3) which may also effect closing of the cast-off rows of stitches.

The above described knitting device embodying the present invention operates as follows:

As soon as previously formed stitches are cast-off, the needles rise to the level of the casting-off ledge 21 (Fig. 2) or 22 (Fig. 3), thereby to tension the stitches which are closed either by means of the sinkers 12 or the sinkers 23. During the casting-off operation, selected needles of the needle ring are elevated, for example, by the pattern wheel 1, into positions for feeding of the backing thread 3. The sinkers 12 are advanced or moved radially outward by the cam ring 25 so that the upper ledge 13 of each sinker 12 associated with an elevated needle is disposed radially outward relative to the latter and the backing thread can therefore rest on the upper ledge 13.

At the same time, the locking element 16 associated with each selected needle remains radially inward with respect to the latter (Fig. 5).

After feeding of the backing thread with the sinker and locking elements 12 and 16 in the positions of Fig. 5, the locking elements 16 are moved radially outward by the cam ring 25 so that the nib 17 of the locking elements cooperate with the noses 15 of the associated sinker elements to enclose the backing thread 3 within the space 18. When the sinker and locking elements 12 and 16 are thereafter retracted in the radially inward direction, the backing thread 3 held within the enclosed spaces 18 is drawn across the raised selected needles 2 (Fig. 6) thereby to ensure that, when the other needles are subsequently elevated by the cam portion 4, those elevated needles other than the originally selected needles will lie radially outward or in front of the backing thread, even in those cases where the latter has many short loops.

As all of the needles are elevated, by the cam portion 4, to the position for receiving the binding thread 6, the backing thread lying on the ledges 13 of the sinker elements 12 is positioned against the shafts or shanks of the elevated needles at locations below the latches thereof, while the cam 25 then moves the sinkers radially outward, to the sinking position, and retracts the locking elements 16 radially inward in back of the needles to permit the feeding of the binding thread at an elevation above the opened latches (Fig. 7).

While the sinker and locking elements 12 and 16 remain in the positions shown in Fig. 7, the needles are moved downwardly, by the cam portion 7, whereby the binding thread 6 is drawn into a loop over the upper ledge 13 of the sinker element 12 and the backing thread 3 is cast-off over such drawn loop of the binding thread (Fig. 8).

Then, as shown in Fig. 9, the sinker elements are moved radially inward while the locking elements are moved radially outward, by the cam ring 25, so that the paired sinker and locking elements again define spaces 18 enclosing the loops of the binding thread with the cast-off backing thread and the loops of the binding thread are tensioned by the retracting movement of the sinkers so that the latches of the needles are positively opened during the upward movement of the needles by the cam portion 8. The opened latches are in engaging position relative to the upper ledges of the associated sinker elements 12 and in closing position relative to the lower ledges 14 of the sinker elements 12 (Fig. 9).

When the needles are elevated, by cam portion 8, to feeding positions relative to the lower ledge 14 of the sinker elements, the top or facing thread 11 is fed in at the location C (Fig. 10).

As the needles are lowered further by the cam portion 9, the needles draw loops of the top thread 11 over the lower ledge 14 of the sinker elements 12. While the needles are being lowered by the cam portion 9, the cam ring 25 is simultaneously effecting radially inward movement of the sinker elements 12 so that, by reason of the relative movement of the sinker and locking elements, the loops of the binding thread with the cast-off backing thread are gradually released. The loops of the binding thread with the cast-off backing thread are fully released only at the movement when the tips of the needle hooks 2*a* are disposed below the lower ledges 14 of the sinker elements so that the released loops cannot slide out of the hook nor change their positions relative to the top or facing thread (Fig. 11). This assures uniformity and complete covering of the base.

After the loops of the top or facing thread 11 have been drawn and interlaced with the loops of the binding thread 6, the needles are moved further downward, by the cam portion 10, until the needles are disposed below the casting-off ledge 21 of the needle cylinder or the ledges 23 of the additional sinkers 22 (Fig. 3), so that

the previously formed stitches are cast-off over the newly formed loops. During such further downward movement of the needles by the cam portion **10**, the retracting movement of the sinker and locking elements continues in synchronism with the needle movement so that the newly formed loops are released only at the moment of contact thereof with the previously formed stitches. Thus, overthrowing of the threads, which would result in incomplete or poor covering of the backing, cannot occur. During this last phase of the operation, as illustrated in Fig. 12, the previously formed stitches may be subjected to so-called equalization by adjustment of the cam portion **10** which is suitably mounted for this purpose.

Although illustrative embodiments of this invention have been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. In a device for knitting a backed fabric incorporating backing, binding and facing threads; the combination of a ring of vertically movable latch needles, a needle cylinder supporting said needles for vertical movement, a series of sinker elements extending radially outward from within said ring between the successive needles of the latter and each having upper and lower ledges and a nose extending above and radially outward from said upper ledge, means for feeding backing, binding and facing threads at successive feeding locations around

said ring at the level well above that of said upper ledges and at the level of said lower ledges, respectively, a locking element movable radially adjacent each of said sinker elements and having a downwardly directed nib at its radially outer end adapted to register, and thereby cooperate, with said nose of the related sinker element in defining an enclosed space behind said nose, and cam means for raising and lowering said needles and for effecting radially outward advancement and radially inward retraction of said sinker and locking elements.

2. In a device for knitting a backed fabric incorporating backing, binding and facing threads; the combination as in claim 1, wherein said cam means for effecting advancement and retraction of said sinker and locking elements includes a double-tracked cam ring acting on said elements and having adjustable portions operative during the drawing of loops in the binding thread and in the facing thread, thereby to make possible the adjustment of the lengths of advancement and retraction of said sinker and locking elements in relation to the lengths of such loops.

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